REMARKS

Claims 1, 3-6, 8-15, 23, 24, 26-33, 35-42, 44-52, 59-67, and 69-110 are pending in the application, with claims 2, 7, 25, 31, 43, 58, and 68 having been canceled above, all of which claims stand rejected. Independent claims 1, 6, 23, 30, 42, 52, and 60 have been amended above to incorporate subject matter from dependent claims 2, 7, 25, 31, 43, 58 and 68, respectively. Claims 3, 4, 32, 42, and 68 have been amended to adjust their dependencies to account for the deletion of claims from which they originally depended. Independent claims 34 and 41 have been amended to include the feature of a "geometric deformable model."

REJECTIONS UNDER 35 U.S.C. 102

Claims 1-5, 9-15, 30-44, 60-65, 68-108, and 110 stand rejected under 35 U.S.C. 102(b) "as being anticipated by Cline et al. (4729098). Cline et al. disclose a method and system including a computer implemented method for interactively displaying three-dimensional structures comprising the formation of a three-dimensional volume of data from a series of two-dimensional images representing a physical property associated with a three dimensional body (col. 5 lines 1-4), segmenting a region of interest from the volume of data based on selected values of the physical property representing the region of interest (col. 19 lines 33-38), producing a wireframe model of the segmented region of interest, the wireframe model comprising a plurality of vertices with each vertex having a coordinate position (col. 3 lines 15-59). Cline et al. also teach means for refining the wireframe model by adjusting the coordinate positions of the vertices along a normal vector associated with each vertex to more accurately represent the region of interest (col. 5 lines 24-28 lines 56-60, col. 17 lines 10-34, claim 1). Cline et al. further teach rendering the wireframe model in an interactive three-dimensional display, producing a virtual three-dimensional environment (col. 4 lines 60-63)."

Turning first to independent claims 1, 30, and 42, Applicant has amended claim 1 to incorporate the subject matter of claim 2 which recites in relevant part that "the refinement means adjusts the coordinate positions of the vertices along a normal vector associated with each vertex." (Emphasis added.) Likewise, Applicant has amended independent claim 30 to incorporate the subject matter of claim 31 which recites in relevant part that "the refinement

means adjusts the coordinate positions of the vertices along a normal vector associated with each vertex." (Emphasis added.) Similarly, Applicant has amended independent claim 42 to incorporate the subject matter of claim 43 which recites in relevant part that "the refinement step adjusts coordinate positions of vertices of the wireframe model along a normal vector associated with each vertex at a rate that is a function of a surface curvature at the coordinate position." (Emphasis added.)

Applicant respectfully submits, that contrary to the assertions made in the Office Action, that Cline fails to disclose the feature that the refinement means/step "adjusts coordinate positions of the vertices *along* a normal vector associated with each vertex" as variously recited in independent claims 1, 30, and 42 as amended. Specifically, Applicant respectfully disagrees with the assertion in the Office Action that Cline discloses such a feature at "col. 5 lines 24-28 lines 56-60, col. 17 lines 10-34, claim 1". As a first point, Applicant respectfully points out that the cited text of Cline never discloses "a normal vector associated with each vertex", let alone adjusting "coordinate positions of the vertices along a normal vector associated with each vertex." Indeed, the word "normal" never even occurs in the cited text at column 5 of Cline. To the contrary, the "interpolation means" of Cline that is "provided to adjust coordinate values" specifically *discloses making such an adjustment along a direction other than that of a normal vector*. (Column 5, lines 24-28. Emphasis added.) Specifically, Cline states that the coordinate values are adjusted "in a non-linear fashion based on three or more data values *obtained along a grid line*." In contrast, Applicant's claimed invention recites adjusting coordinate positions along a normal vector. The grid line of Cline is not a normal vector as claimed by Applicant. ***The recited grid line of Cline is the antithesis of the normal vector claimed by Applicant***. That is, the grid lines of Cline are the lines connecting the vertices shown in Fig. 6A, and these gridlines by definition lie within the plane of the tesselated surface and the coordinates are adjusted to the location of the hollow circles *along* the gridlines as illustrated in Fig. 6B. (Column 6, lines 14-17.) Adjustment is not made along a vector normal to each vertex (and again there is no normal to each vertex provided in the cited text of Cline).

Moreover, the "normal vector" disclosed in Cline at column 17 is not a "normal vector associated with each vertex" or any vertex. The normal vector disclosed in the cited text of Cline is "associated with each triangular or a polygonal region." (Column 17, lines 11-14. Emphasis

added.) A normal vector associated with a triangular or polygonal region is not a normal vector associated with the vertex. For instance, a triangular region has three vertices, yet the region as a whole has only a single normal vector associated therewith. Applicant's claimed invention has a normal vector "*associated with each vertex*", and not a single normal vector associated with a particular region. Thus, Cline at column 17 also fails to disclose Applicant's claimed feature of "a normal vector associated with each vertex" as variously recited in independent claims 1, 30, and 42.

In addition, the cited text at column 17 of Cline is completely unrelated to the "interpolation means" and adjustment of coordinate values in the text cited at column 5. Instead, the text at column 17 of Cline is concerned with ***shading*** "on a grayscale basis in dependence upon the relation between the viewing angle... to produce smoothly shaded images..." (Column 17, lines 20-25.) The use of a vector normal to a triangular or polygonal region to perform the function of shading is not Applicant's claimed use of a normal vector associated with each vertex to provide the function of adjusting coordinate positions of the vertices along the normal vector as recited in independent claims 1, 30, and 42. Still further, claims 31 and 42 further recite that the adjustment occurs at "a rate that is a function of a surface curvature at the coordinate position", which feature the Office Action fails to even allege as being present in Cline. Hence, the Office action fails to even make a prima facie case of anticipation of claim 31 and 42 at least with respect to this quoted in feature.

Thus, for at least the reasons cited above Cline fails to disclose each and every element recited in amended claims 1, 30, and 42. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejections of independent claims 1, 30, and 42, as well as claims 3-5, 32, 33, and 44, which depend respectively therefrom. In addition, still additional features exists in several of the dependent claims that are not found in Cline.

For example, with regard to dependent claims 3, Cline fails to disclose that "the refinement means adjusts the coordinate positions of the vertices along a normal vector associated with each vertex *as a function of a surface curvature* at the coordinate position." (Emphasis added.) The only statement in the Office Action regarding any type of curvature is that "[t]he vertex grouper comprises a curvature calculator for calculating a curvature at each of

the vertices (col. 15 lines 33-46)." As a first matter Applicant respectfully points out that the text cited at column 15, lines 33-46 refers to the intensity profile curve shown in Fig. 7, where intensity is plotted as a function of pixel distance to provide an *intensity* curve. An intensity curve is not a "surface curvature" (i.e., a geometric curvature of a surface) as claimed by Applicant. Hence, the cited text of Cline fails to disclose Applicant's claimed "surface curvature", let alone adjusting "the coordinate positions of the vertices along a normal vector associated with each vertex *as a function of a surface curvature* at the coordinate position." Hence, Cline fails to disclose each and every element of dependent claim 3, and accordingly, Applicant respectfully requests that the Examiner withdraw the rejection of claim 3.

With regard to dependent claims 4, 32, and 44, such claims recite that the refinement means/step "adjusts the coordinate positions of the vertices along a normal vector associated with each vertex by determining an inner wall position and an outer wall position from a first and a second degree derivative associated with the coordinate positions of the vertices". Again, the Office Action fails to even allege that such features are to be found within Cline, and Applicant respectfully requests the Examiner therefore withdraw the rejections of claims 4, 32, and 44 or indicate where such features are to be found.

Turning next to independent claims 9, 13, 35, 39, and 60 such claims variously recite the features of "vertex grouping means for grouping the vertices of the wireframe model into regions having abnormal structure" and "grouping the vertices of the wireframe model into regions having a characteristic indicating abnormal structure". Applicant clearly recites in claims 9, 13, 35, 39, and 60 that *vertices are grouped* for regions having a characteristic indicating abnormal structure. For example, "At step 44, vertices representing an abnormality are selected. Those vertices meeting selected criteria can be identified as abnormal vertices. For example, vertices having abnormal thickness and/or convexity and/or curvature criteria may be identified as abnormal vertices. In a specific application, the wall thickness values, local convexity values, and local curvature values can be used, independently or in conjunction with each other, to either accept or reject vertices as being abnormal. The individual parameters can be combined using a logical AND operation. At step 45, the vertices on the wireframe model associated with

abnormal structure (i.e., having a combination of associated abnormal wall thickness and/or abnormal shape, such as abnormal local convexity and/or abnormal local curvature) are grouped into populations." (Specification at page 32, lines 8-25.)

In contrast the text of Cline cited in the Office Action has nothing to do with grouping, nothing to do with grouping of vertices, and nothing to do with grouping of vertices into regions having a characteristic indicating abnormal structure as claimed by Applicant. To the contrary, the text in Cline cited in the Office Action indicates that Cline does no grouping, but simply displays all data whether abnormal or not together without differentiating. In this regard, the Office Action states that "Cline et al. also teach analyzing specific abnormalities or defects (col. 19 lines 45-51) and rendering the wireframe model in an interactive three-dimensional display to indicate the regions having abnormal structure." The text cited at column 19, lines 45-51 does not disclose Applicant's above-quoted feature as recited in claims 9, 13, 35, 39, and 60. Instead, the cited text of Cline states with reference to Figs. 10-13 that "[i]n the subject being studied, it is seen that there is a bone defect at the base of the left eye between the nose and the eye. Views of this defect are also obtainable from the back, through any selected plane and at any desired viewing angle. Thus, a diagnostician or surgeon is readily capable of viewing the exact structure that a corrective procedure would encounter." All the quoted text indicates is that a bone defect may be seen by the diagnostician or surgeon viewing the display. As can be clearly seen from Figs. 10-13 all the data of the subject both normal and defective are displayed together with out differentiation. There is no indication in the figures of Cline or the associated cited text that any grouping of vertices of an abnormal structure is being performed. All the data is simply being displayed together, leaving it to the observer to figure out what is a defect and what is normal. Hence, Cline fails to disclose each and every element recited in independent claims 9, 13, 35, 39, and 60. Accordingly Applicants respectfully request that the Examiner withdraw the rejections of independent claims 9, 13, 35, 39, and 60, as well as claims 8, 10-12, 36-38, 40, 61-67, and 69 which depend respectively therefrom. In addition, still additional features exists in several of the dependent claims that are not found in Cline.

For example, with regard to dependent claims 10 and 36, the Office Action fails to indicate where in the prior art the feature that "the analyzing means comprises means for evaluating two principal curvatures associated with each point in an elliptical region" is to be

found. The word "elliptical" appears to not even exist in Cline. Accordingly for at least this additional reason, Applicant respectfully requests the Examiner withdraw the rejections of dependent claims 10 and 36 in view of Cline, as well as claims 10-12 and 37-38 which depend variously therefrom. Likewise with respect to claim 69, the Office Action fails to indicate where in the prior art the features of "a. a mean curvature calculator for calculating a mean curvature at each of a selected number of vertices; b. a gaussian curvature calculator for calculating a gaussian curvature at each of the selected number of vertices; and c. classification means for classifying the selected vertices according to the mean curvatures and the gaussian curvatures of the vertices"is to be found. The word "gaussian" appears to not even exist in Cline. Accordingly for at least this additional reason, Applicant respectfully requests the Examiner withdraw the rejections of dependent claim 69 in view of Cline.

Turning next to independent claims 34, 41, and 70, such claims recite the feature of "refining the wireframe model using a geometric deformable model." Applicant has provided a definition of geometric deformable model in the specification at page 23, lines 8-11: "In a geometric deformable model, a surface is treated as a wave front that propagates in space over time until a targeted boundary is reached." Again, the Office Action does not indicate where in Cline such a feature is to be found, and in fact the word "deformable" appears not to be present anywhere in Cline. Therefore, Applicant respectfully requests that the Examiner withdraw the rejection of claim claims 34, 41, and 70, as well as claims 71-94 which depend respectively therefrom. In addition, yet additional reasons exist for allowing several of the dependent claims.

For instance, dependent claim 71 recites the grouping of vertices having a characteristic indicating abnormal structure, which is not found in Cline as argued above with regard to claims 9, 13, 35, 39, and 60. Claim 72 recites analogous features to claim 69, and is allowable for the same reasons given above with regard to claim 69. Claims 73, 74, and 75 recite "labeling patches having an elliptical classification", and as already pointed out above the word "elliptical" does not even appear in Cline. Similarly for the remaining claims 76-94 at least one feature is present in each of such claims which is not addressed by the Office Action and/or is not present in Cline. Thus, for at least these additional reasons Applicant respectfully submits that each of

dependent claims 71-94 contain additional subject matter which is not disclosed in Cline and/or has not been addressed in the Office Action. Accordingly, Applicant respectfully submits that such dependent claims are additionally further patentable over Cline.

Turning next to independent claims 95 and 103, claim 95 recites the feature of "grouping the vertices by: calculating a mean curvature at each of a selected number of vertices, calculating a gaussian curvature at each of the selected number of vertices, classifying the selected vertices according to the mean curvatures and the gaussian curvatures of the vertices, and collecting adjoining vertices of similar classification into patches of similar vertex classification..." Claim 103 recites "a vertex grouper for collecting adjoining vertices having similar classifications based on mean and gaussian curvatures into patches of similar vertex classification."

As already explained above, the text of Cline cited in the Office Action relating to an intensity curve has nothing to do with the curvature recited here. Also, the"Gaussian" does not appear anywhere in Cline. Still further, Cline makes no mention whatsoever of classifying or collecting vertices of similar classification into patches based on curvature as variously recited in claims 95 and 103. In addition, the Office Action fails to even allege where such features are to be found in Cline.

In contrast, Applicant has explained in the specification how the physical curvature may be used in the manner recited in claims 95 and 103. (Cf. Page 30, line 21 - page 31, line 21) which is not to be found in Cline. Accordingly, Applicant respectfully submits that high fails to disclose each and every element recited in claims 95 and 103, and therefore request that the Examiner withdraw the rejections of claims 95 and 103, as well as claims 96-102 and 104-110 which depend respectively therefrom. Furthermore, the Examiner will note that many of the features disclosed independent claims 96-102 and 104-110 are similar to those found in other dependent claims already discussed above, and therefore such claims are additionally patentable over Cline for the same reasons discussed above.

REJECTIONS UNDER 35 U.S.C. 103(a)

Claims 6-8, 66, 67, and 109 stand rejected under 35 U.S.C. 103 "as being unpatentable over Cline et al. in view of Natarajan (5517602)." Claims 23-29 and 45-59 stand rejected under 35 U.S.C. 103 "as being unpatentable over Cline et al. in view of King, Jr. 5608849)."

Turning first to claim 6, claim 6 has been amended to include the subject matter of dependent claim 7 and now recites that "the isosurface creation means comprises means for identifying a seed voxel from the segmented region of interest and means for producing an isosurface patch associated with the seed voxel." The Office Action fails to allege where such a feature is to be found in the proposed combination of Cline and Natarajan, and the word "seed" is not even to be found in Cline or Natarajan. Hence, the Office Action fails to make a prima facie case of obviousness, since all the claimed features are not shown to be present in the proposed prior art combination. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejection of independent claim 6, as well as claim 8 which depends therefrom, or indicate where such claim features may be found in the proposed combination.

Regarding independent claims 23 and 45, such claims have been amended to recite the feature of "generating a zone around the tissue and issuing an indicator when a tip of the biopsy needle is within the zone", which feature was originally included independent claims 25 and 47, respectively. The Office Action fails to allege where such a feature is to be found in the proposed combination of Cline and King, and the words "zone" and "indicator" are not even to be found in Cline or King. Hence, the Office Action fails to make a prima facie case of obviousness, since all the claimed features are not shown to be present in the proposed prior art combination. Accordingly, Applicant respectfully requests that the Examiner withdraw the rejection of independent claims 23 and 45, as well as claims 24, 26-29, 46, and 48-51 which depend respectively therefrom, or indicate where such claim features may be found in the proposed combination.

In view of the foregoing amendments and remarks, it is believed that the claims in this application are now in condition for allowance. Early and favorable reconsideration is respectfully requested. The Examiner is invited to telephone the undersigned in the event that a telephone interview will advance prosecution of this application.

Respectfully submitted,

/Niels Haun/_____

Niels Haun, PTO Reg. No. 48,488

DANN DORFMAN HERRELL & SKILLMAN
A Professional Corporation
1601 Market Street, Suite 720
Philadelphia, PA 19103
Phone: (215) 563-4100
Fax: (215) 563-4044